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Year 10 Stage 5.3 Mathematics Assignment Term 3 2023

Equations, Geometrical Figures, Congruence and Similarity, & Indices		
Task number: 3	**Weighting: 15%**	**Due Date: 31/08/2023**

Nature and description of the task:

Today you are receiving a "Preparation Booklet" with a series of problems. You are expected to investigate/attempt each of these questions and submit the solutions on the due date. On the 31st August 2023 you will receive a selection of questions similar to those in this preparation activity booklet. You will have 30 minutes to complete an in-class Validation Task.

The final mark for this assessment is broken down as follows:

- Take-home Preparation Booklet = 70%
- In-class Validation Task = 30%

NOTE:
- You will **NOT** have access to the Preparation Booklet during the in-class Validation Task.
- Marks may be deducted for a lack of working out. Please show all working out for all short answer questions.

Outcomes assessed:

MA5.1-12SP uses statistical displays to compare sets of data, and evaluates statistical claims made in the media

MA5.2-15SP uses quartiles and box plots to compare sets of data, and evaluates sources of data

MA5.2-16SP investigates relationships between two statistical variables, including their relationship over time

MA5.3-18SP uses standard deviation to analyse data

MA5.3-19SP investigates the relationship between numerical variables using lines of best fit, and explore how data is used to inform decision-making processes

MA5.3-5NA selects and applies appropriate algebraic techniques to operate with algebraic expressions

MA5.3-7 NA solves complex linear, quadratic, simple cubic and simultaneous equations, and rearranges literal equations

MA5.3-8 NA uses formulas to find midpoint, gradient and distance on the Cartesian plane, and applies standard forms of the equation of a straight line

MA5.3 15MG applies Pythagoras' theorem, trigonometric relationships, the sine rule, the cosine rule and the area rule to solve problems, including problems involving three dimensions

Non-Completion of Task:

If you know you are going to be away on the day of the Validation Task, you must make alternative arrangements with your teacher beforehand. If you are suddenly away on the day of the Task, you must contact your teacher on your return to school. Documentation will be required in both cases.Plagiarism, the using of the work of others without acknowledgement, will incur serious penalties and may result in a zero award. Any cheating will also incur penalties.

Failure to follow the above procedures may also result in a zero award. The policies and procedures that are outlined on the ROSA booklet will be followed regarding the non-completion of assessment tasks.

MARKS

OUTCOME	MARKS
DATA **MA5.1-12SP** uses statistical displays to compare sets of data, and evaluates statistical claims made in the media **MA5.2-15SP** uses quartiles and box plots to compare sets of data, and evaluates sources of data **MA5.2-16SP** investigates relationships between two statistical variables, including their relationship over time **MA5.3-18SP** uses standard deviation to analyse data **MA5.3-19SP** investigates the relationship between numerical variables using lines of best fit, and explore how data is used to inform decision-making processes	**/10**
EXPRESSIONS, EQUATIONS & LINEAR RELATIONSHIPS **MA5.3-5NA** selects and applies appropriate algebraic techniques to operate with algebraic expressions **MA5.3-7 NA** solves complex linear, quadratic, simple cubic and simultaneous equations, and rearranges literal equations **MA5.3-8 NA** uses formulas to find midpoint, gradient and distance on the Cartesian plane, and applies standard forms of the equation of a straight line	**/26**
TRIGONOMETRY MA5.3-15MG applies Pythagoras' theorem, trigonometric relationships, the sine rule, the cosine rule and the area rule to solve problems, including problems involving three dimensions	**/27**
TOTAL	**/63**

SHOW ALL WORKING in the space provided.

1. A score was added to this set of scores: 53, 55, 62, 75, 80. The new mean is now 66.
   What score was added?

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2. The box-and-whisker plot below shows the weights of University Students based on their gender.

   Actual weights of university students
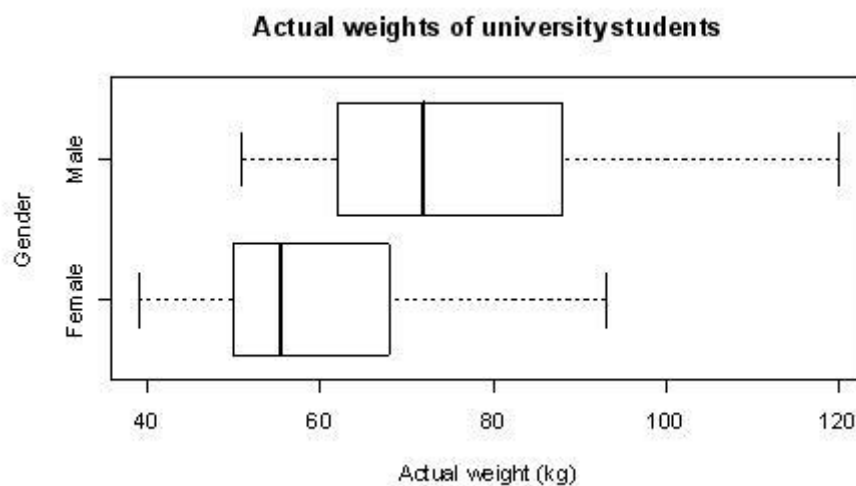
   a. Describe the shape of the male weight distribution.　　　　　　　　　　**1**

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   b. Compare and contrast the data displayed above, making reference to the median, range and
      interquartile range.　　　　　　　　　　　　　　　　　　　　　　　　**2**

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3. The frequency table below shows the number of cars that are garaged each night in a certain street.

For this data, calculate:

a. the mean. **1**

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b. the median. **1**

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c. the standard deviation. **1**

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Number of cars (x)	Frequency (f)	fx
1	9	
2	6	
3	2	
4	1	
5	1	
	Σf	Σfx

4. Analyse the scatterplot and line of best fit given below to answer the following problems.
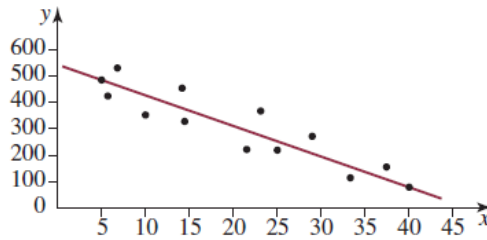
a. The line of best fit passes directly through the point (5, 480) and has the gradient $m = -9.5$. Determine the equation of the line in the form $y - y_1 = m(x - y_1)$. **2**

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b. Using your answer from part (b), interpolate the value of y when x is 28. **1**

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END OF SECTION I

4

2 marks each

5. Simplify the following expression:

$$-x^2y \div 3xy^3z$$

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6. Solve the following equation:

$$7h + 5 = 2h - 6$$

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7. Determine the equation of the line:

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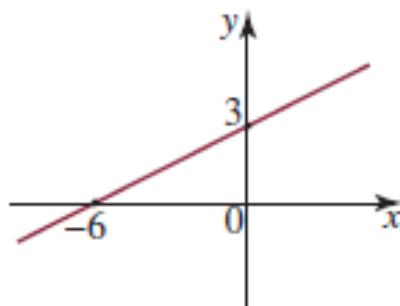
8. Solve the following equations. **2 marks each**

   a. $\dfrac{8n}{11} + 2 = 10$

   b. $-(13 - s) = 14(7s + 6)$

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9. Solve the following linear equation. **2**

$$\frac{x}{2} - \frac{3x}{5} = \frac{1}{4}$$

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10. Solve the following linear equation. **2**

$$\frac{6 - x}{3} = \frac{2x - 1}{5}$$

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11. Calculate the length of an interval that passes through the points (-3,-2) and (4,6).

   Round your answer correct to 1 decimal place.   **1**

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12. Determine the equation of a line that is perpendicular to the line $y = 3x + 1$ and passes

   through the point (3, 5).

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13. Solve the following simultaneous equations using the elimination method.

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$$x + 2y = 4 \quad (1)$$
$$3x + 4y = 2 \quad (2)$$

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14. Two adults and 4 children pay $172 to enter the theme park, whereas 3 adults and 2 children pay $158. What would be the entry fee for 4 adults and 3 children?

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15. Graph the following linear equations on the axes provided. **2 marks each**
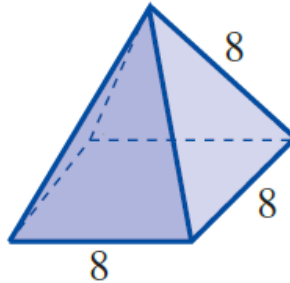
(a) $y = \dfrac{2}{3}x + 1$

(b) $2x + 4y + 8 = 0$
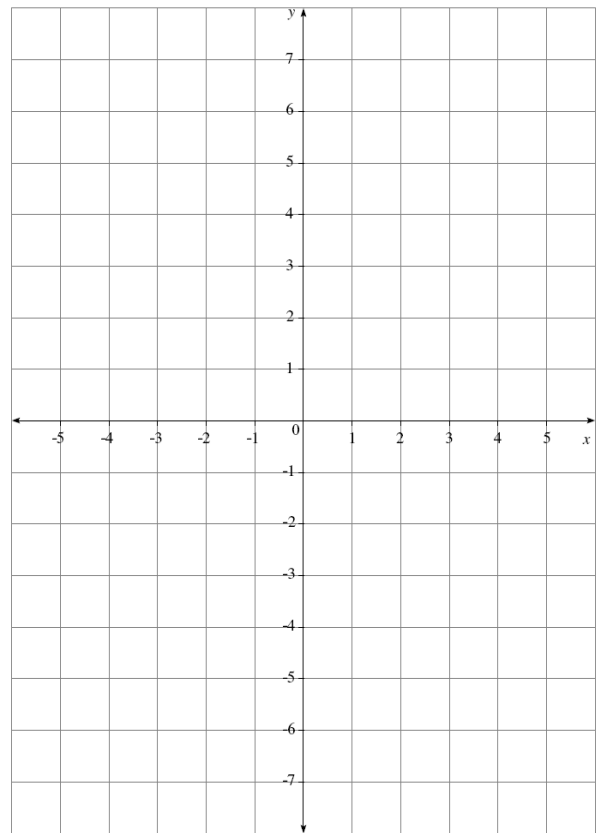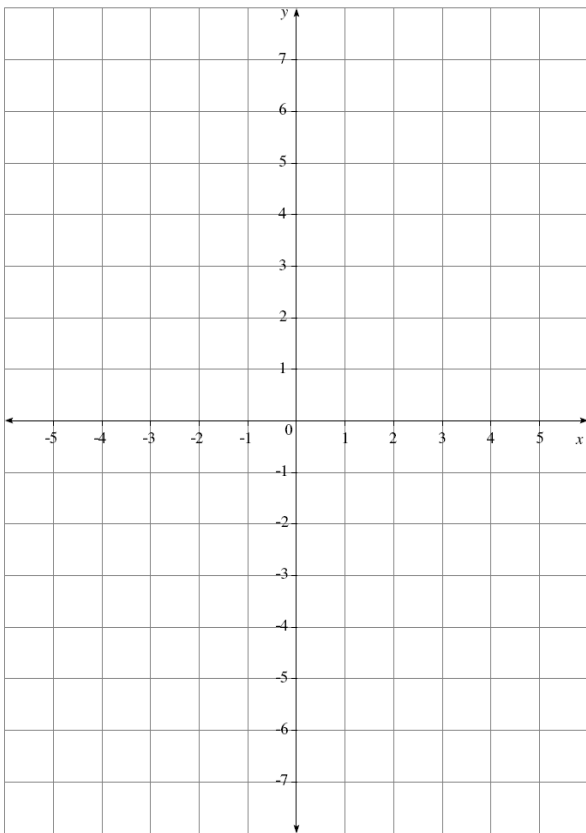
END OF SECTION II

1 mark each

16. Using Pythagoras' Theorem, calculate the height of the pyramid below, correct to 2 decimal places.
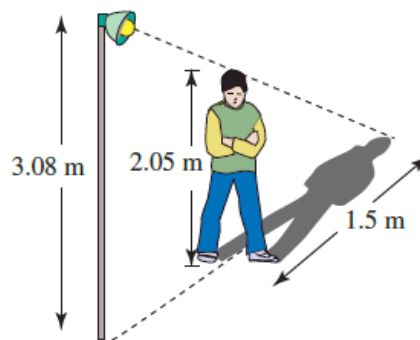
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17. A 2.05 m tall man, standing in front of a streetlight 3.08 m high, casts a 1.5 m shadow. What is the angle of depression from the top of the streetlight to the end of the shadow? Assume the pole is perpendicular to the ground.
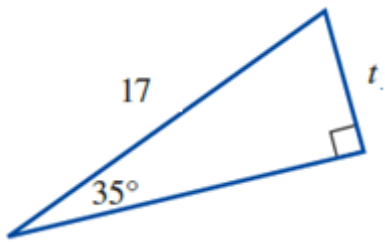
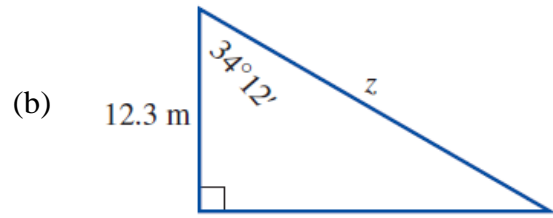………………………………………………………………………………………..

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18. Calculate the unknown sides in the right-angled triangles below. **2 marks each**
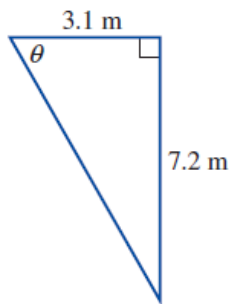
    Round your answer correct to 1 decimal place.

(a)

17   35° t

(b)   12.3 m   34° 12′ z

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19. Calculate the size of the unknown angle below, correct to the nearest minute. **2**

3.1 m θ 7.2 m

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20. If a farmhouse is situated 320 m 035°*T* from a shed.

   a. Draw a diagram to represent this information.   **1**

   b.   Calculate how far North the farmhouse is from the shed.
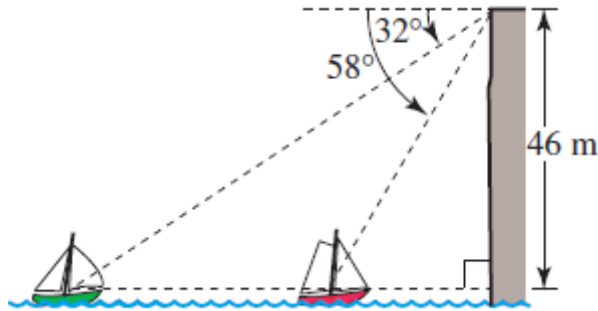   Round your answer to the nearest metre.   **1**

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   c. What is the true bearing of the shed from the farmhouse?   **1**

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21. From a point on top of a cliff, two boats are observed. If the angles of depression are 58° and 32° and the cliff is 46 m above sea level, how far apart are the boats? Round your answer to the nearest metre.

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22. Solve $\cos x = -\frac{\sqrt{3}}{2}$ for the domain $0 < x < 360°$.

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23. A triangle ABC has $\angle A = 50°$, $AC = 7$ cm and $BC = 6$ cm.

Use the sine rule to find the value of $\angle B$, correct to one decimal place, given that:

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a. $\angle B$ is acute

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b. $\angle B$ is obtuse

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24. Consider $\theta = 195°$.

1 mark each

c. Which quadrant of the unit circle does θ lie in?

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d. Which of the three trigonometric ratios ($\sin \theta$, $\cos \theta$ and $\tan \theta$) are positive for this value of θ?

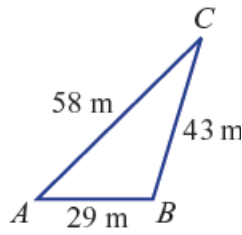……………………………………………………………………………………..

e. State the reference angle in the first quadrant for θ.

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f. Write $\cos 195°$ using the reference angle.

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25. A paddock ABC is fenced off as shown in the figure below.

g. Use the cosine rule to find the value of ∠A, correct to three decimal places.

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h. Hence, find the area enclosed by the fences, correct to two decimal places.

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i. The paddock is to be divided into two triangular paddocks by constructing a fence from point B to meet AC at right-angles at a point D. Determine how many metres of fencing will be required to construct BD to the nearest centimetre.

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END OF EXAMINATION